# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER OF PATENTS AND TRADEMARKS
Washington, D.C. 20231
www.uspto.gov

| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|---|---|---|---|---|
| 09/249,728 | 02/13/1999 | DANIEL LOPEZ | 97123-0 | 1252 |

7590          12/27/2002

STEVEN E SHAPIRO ESQ
MITCHELL SILBERBERG & KNUPP LLP
11377 WEST OLYMPIC BOULEVARD
LOS ANGELES, CA   900641683

| EXAMINER |
|---|
| DASTOURI, MEHRDAD |

| ART UNIT | PAPER NUMBER |
|---|---|
| 2623 | 10 |

DATE MAILED: 12/27/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

| | Application No. | Applicant(s) |
|---|---|---|
| **Office Action Summary** | 09/249,728 | LOPEZ ET AL. |
| | Examiner | Art Unit |
| | Mehrdad Dastouri | 2623 |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE <u>3</u> MONTH(S) FROM
THE MAILING DATE OF THIS COMMUNICATION.
- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed
  after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any
  earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1) ☒ Responsive to communication(s) filed on <u>03 October 2002</u> .

2a) ☐ This action is **FINAL**.     2b) ☒ This action is non-final.

3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is
closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4) ☒ Claim(s) <u>1-22</u> is/are pending in the application.

    4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5) ☐ Claim(s) _____ is/are allowed.

6) ☒ Claim(s) <u>1-22</u> is/are rejected.

7) ☐ Claim(s) _____ is/are objected to.

8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9) ☐ The specification is objected to by the Examiner.

10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.

    Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.

    If approved, corrected drawings are required in reply to this Office action.

12) ☐ The oath or declaration is objected to by the Examiner.

**Priority under 35 U.S.C. §§ 119 and 120**

13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

    a) ☐ All b) ☐ Some * c) ☐ None of:

      1. ☐ Certified copies of the priority documents have been received.

      2. ☐ Certified copies of the priority documents have been received in Application No. _____ .

      3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage
application from the International Bureau (PCT Rule 17.2(a)).

    * See the attached detailed Office action for a list of the certified copies not received.

14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

    a) ☐ The translation of the foreign language provisional application has been received.

15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

**Attachment(s)**

1) ☒ Notice of References Cited (PTO-892)      4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)      5) ☐ Notice of Informal Patent Application (PTO-152)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .      6) ☐ Other: .

## DETAILED ACTION

### *Reopening of Prosecution*

1.      In view of the appeal brief filed on October 3, 2002, PROSECUTION IS HEREBY

REOPENED.   A new grounds of rejection set forth below.

To avoid abandonment of the application, appellant must exercise one of the

following two options:

(1) file a reply under 37 CFR 1.111 (if this Office action is non-final) or a reply

under 37 CFR 1.113 (if this Office action is final); or,

(2) request reinstatement of the appeal.

If reinstatement of the appeal is requested, such request must be accompanied

by a supplemental appeal brief, but no new amendments, affidavits (37 CFR 1.130,

1.131 or 1.132) or other evidence are permitted. See 37 CFR 1.193(b)(2).

### *Claim Rejections - 35 USC § 102*

2.      The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that

form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in a patent granted on an application for patent by another filed in the
United States before the invention thereof by the applicant for patent, or on an international application
by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this
title before the invention thereof by the applicant for patent.

The changes made to 35 U.S.C. 102(e) by the American Inventors Protection Act of 1999 (AIPA)
and the Intellectual Property and High Technology Technical Amendments Act of 2002 do not
apply when the reference is a U.S. patent resulting directly or indirectly from an international
application filed before November 29, 2000. Therefore, the prior art date of the reference is
determined under 35 U.S.C. 102(e) prior to the amendment by the AIPA (pre-AIPA 35 U.S.C.
102(e)).

3.      Claims 1-13, 16, 17 and 19 are rejected under 35 U.S.C. 102(e) as being

anticipated by Mansfield et al (U.S. 5,965,306).

Regarding Claim 1, Mansfield et al disclose a method for detecting defects in a

reticle used in integrated circuit chip fabrication comprising:

(a) obtaining digital image data corresponding to an image of a reticle (Column

2, Lines 1-15; Column 5, Lines 7-12);

(b) processing the digital image data according to predetermined criteria to

identify defects (Figure 2, Component 208; Figure 3, Component 305; Figure 4,

Component 411; Column 6, Lines 62-67; Column 7, Lines 1-8);

(c) simulating a response that would be produced if a defective reticle were to be

utilized in a photolithographic system, by processing the digital image data

corresponding to the reticle (Column 4, Lines 66-67, Column 5, Lines 1-12; Column 7,

Lines 41-50; Column 8, Lines 54-67, Column 9, Lines 1-20).

Regarding Claim 2, Mansfield et al further disclose a method according to Claim

1, wherein the digital image data are obtained by scanning the reticle (Column 2, Lines

1-15. Scanning the reticle is an inherent process of Aerial Image Measurement System

(AIMS) ).

Regarding Claim 3, Mansfield et al further disclose a method according to Claim

1, wherein the defects are identified in step (b) by comparing the digital image data to

reference image data (Column 4, Lines 30-41; Column 6, Lines 62-67, Column 7, Lines

1-8).

Regarding Claim 4, Mansfield et al further disclose a method according to Claim 1, wherein step (c) simulated an aerial image, which would be produced by the reticle (Column 2, Lines 7-15; Column 7, Lines 41-46; Column 8, Lines 54-67, Column 9, Lines 1-4).

Regarding Claim 5, Mansfield et al disclose a method according to Claim 1, further comprising a step of categorizing defects based on simulation results produced in step (c) (Column 7, Lines 41-46; Column 9, Lines 13-21. Based on the mask critical dimension (CD) errors, the defects are categorized to verify whether it is necessary to be repaired or not. This will determine if an undesirable feature on a mask (reticle) is a critical defect or not.).

Regarding Claim 6, Mansfield et al further disclose a method according to Claim 1, wherein the digital image data are in raster format (Column 2, Lines 1-15. Aerial Image Measurement System (AIMS) inherently generate digital images of lithographic mask. A digital image is inherently in a raster format containing rectangular array of pixels that can be addressed individually.).

Regarding Claim 7, Mansfield et al further disclose a method according to Claim 1, further comprising a step of modifying a format of the digital image prior to performing step (c) (Column 10, Lines 4-33).

Regarding Claim 8, Mansfield et al further disclose a method according to Claim 1, further comprising a step of providing a reference simulation for comparison to a simulation produced in step (c) (Column 2, Lines 1-15; Column 5, Lines 3-12; Column 7, Lines 41-50).

With regards to Claim 9, arguments analogous to those presented for Steps (a), (b) and (c) of Claim 1 are applicable to Steps (a), (b) and (d) of Claim 9. Regarding Step (c) of Claim 9, Mansfield et al further disclose specifying a window around one of the defects identified in Step (b) (Column 1, Lines 57-67).

With regards to Claim 10, arguments analogous to those presented for Claim 2 are applicable to Claim 10.

With regards to Claim 11, arguments analogous to those presented for Claim 4 are applicable to Claim 11.

With regards to Claim 12, arguments analogous to those presented for Claim 5 are applicable to Claim 12.

With regards to Claim 13, arguments analogous to those presented for Claim 8 are applicable to Claim 13.

With regards to Claim 16, arguments analogous to those presented for Claim 3 are applicable to Claim 16.

With regards to Claim 17, arguments analogous to those presented for Claim 1 are applicable to Claim 17.

With regards to Claim 19, arguments analogous to those presented for Claim 9 are applicable to Claim 19.

### Claim Rejections - 35 USC § 103

4.      The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the

invention was made to a person having ordinary skill in the art to which said subject matter pertains.
Patentability shall not be negatived by the manner in which the invention was made.

5.      Claims 14, 15, 18 and 20-22 are rejected under 35 U.S.C. 103(a) as being

unpatentable over Mansfield et al (U.S. 5,965,306) in view of Aloni et al (U.S.

5,619,429).

Regarding Claim 14, Mansfield et al do not specifically disclose a method

according to Claim 9, wherein the window is 64 x 64 pixels.  Selection of window size is

an engineering design choice and is based on the specific requirements of the particular

process which is normally is a block of 16 x 16, 32 x 32 or 64 x 64 pixels (Official

notice).

It would have been obvious to a person of ordinary skill in the art at the time the

invention was made to modify Mansfield et al invention to specify a window of 64 x 64

pixels because it is one of the most common size of the windows routinely implemented

in image processing.

Regarding Claim 15, Mansfield et al do not explicitly disclose a method according

to Claim 9, wherein the digital image data processed in step (d) are grayscale data.

Aloni et al disclose an inspection method for identifying integrated circuit defects,

wherein the target and reference image digital data are grayscale data (Column 9, Lines

40-42).

It would have been obvious to a person of ordinary skill in the art at the time the

invention was made to modify Mansfield et al invention according to the teachings of

Aloni et al to process a digital image data comprising grayscale data because it is the

conventional procedure in processing the digital image data routinely implemented in

digital image processing. In digital images, each pixel value (intensity) is associated with a grayscale range, which is a function of the number of bits of the byte representing pixel value (e.g., 0-255 for an eight-bit pixel).

With regards to Claim 21, arguments analogous to those presented for Claim 1 are applicable to Claim 21. Mansfield et al don not explicitly disclose the components of the simulation processor.

Aloni et al disclose a processor for executing stored program instruction; and a memory connected to processor for storing the program instructions steps (Figure 1/ 2 and 13, Processor 67. Memories for storing the program instruction steps are inherently a part of and necessarily connected to the processor.).

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to modify Mansfield et al invention according to the teachings of Aloni et al to explicitly identify components of the processing system because computer-based processing systems conventionally include a processor for executing stored program instruction and a memory connected to processor for storing the program instructions steps.

With regards to Claims 18 and 20, arguments analogous to those presented for Claim 21 are applicable to Claims 18 and 20.

With regards to Claims 22, arguments analogous to those presented for Claims 9 and 21 are applicable to Claim 22.

6.      Claims 1-4, 6-11, 13-17, 19, 21 and 22 are rejected under 35 U.S.C. 103(a) as

being unpatentable over Aloni et al (U.S. 5,619,429) in view of Neary et al (U.S.

6,016,357).

Regarding Claim 1, Aloni et al disclose a method for detecting defects in a reticle

used in integrated circuit chip fabrication comprising:

(a)  obtaining digital image data corresponding to an image of a reticle (Column

2, Lines 34-37; Column 9, Lines 40-42);

(b)  processing the digital image data according to predetermined criteria to

identify defects (Column 10, Lines 8-41).   Aloni et al do not disclose Step (c)

concerning simulating a response that would be produced if the defective reticle were to

be utilized in a photolithographic system, by processing the digital image data

corresponding to the reticle.   Simulation is a well known procedure for modeling

manufacturing products as taught by Neary et al.  Neary et al disclose a method of

repairing a mask for use in lithographic manufacturing of semiconductors comprising the

step of:

(c)  simulating a response that would be produced if a defective reticle were to be

utilized in a photolithographic system, by processing the digital image data

corresponding to the reticle (Figure 2, defect 24; Figures 10 and 16; Column 6, Lines

25-67, Column 7, Lines 1-4, particularly Column 6, Lines 59-65.  Simulation is

performed by obtaining aerial images of the defected mask (reticle) and comparing the

aerial image of the defected mask with the aerial image of the ideal mask.  Simulation

results indicate the defect deviations 78a and 78b as depicted in Figures 16 and 17.).

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to modify Aloni et al invention in accordance with the teachings of Neary et al to simulate a response that would be produced if the defective reticle were to be utilized in a photolithographic system, by processing the digital image data corresponding to the reticle because it will provide necessary corrective steps to modify the defective reticle and prevent mass production of the defected masks or reticles.

Regarding Claim 2, Aloni et al further disclose a method according to Claim 1, wherein the digital image data are obtained by scanning the reticle (Column 9, Lines 40-42).

Regarding Claim 3, Aloni et al further disclose a method according to Claim 1, wherein the defects are identified in step (b) by comparing the digital image data to reference image data (Column 10, Lines 26-29).

Regarding Claim 4, Neary et al further disclose a method according to Claim 1, wherein step (c) simulated an aerial image, which would be produced by the reticle (Column 6, Lines 59-65).

Regarding Claim 6, Aloni et al further disclose a method according to Claim 1, wherein the digital image data are in raster format (Column 9, Lines 40-42. A digital image is inherently in a raster format containing rectangular array of pixels that can be addressed individually.).

Regarding Claim 7, Neary et al further disclose a method according to Claim 1, further comprising a step of modifying a format of the digital image prior to performing step (c) (Figure 3; Column 4, Lines 28-37).

Regarding Claim 8, Neary et al further disclose a method according to Claim 1, further comprising a step of providing a reference simulation for comparison to a simulation produced in step (c) (Figure 10, Step 46; Column 6, Lines 35-45).

With regards to Claim 9, arguments analogous to those presented for Steps (a), (b) and (c) of Claim 1 are applicable to Steps (a), (b) and (d) of Claim 9. Regarding Step (c) of Claim 9, Aloni et al further disclose specifying a window around one of the defects identified in Step (b) (Figure 12, Moving Window 228; Column 25, Lines 63-67, Column 26, Lines 1-22).

With regards to Claim 10, arguments analogous to those presented for Claim 2 are applicable to Claim 10.

With regards to Claim 11, arguments analogous to those presented for Claim 4 are applicable to Claim 11.

With regards to Claim 13, arguments analogous to those presented for Claim 8 are applicable to Claim 13.

Regarding Claim 14, Aloni et al do not specifically disclose a method according to Claim 9, wherein the window is 64 x 64 pixels. The windows specified by Aloni are 32 x 24 pixels. Selection of window size is a designer choice. It would have been obvious to a person of ordinary skill in the art at the time the invention was made to modify Aloni et al and Neary et al combination to specify a window of 64 x 64 pixels because it is one of the most common size of the windows routinely implemented in image processing.

Regarding Claim 15, Aloni et al further disclose a method according to Claim 9, wherein the digital image data processed in step (d) are grayscale data (Column 9, Lines 40-42).

With regards to Claim 16, arguments analogous to those presented for Claim 3 are applicable to Claim 16.

With regards to Claims 17 and 21, arguments analogous to those presented for Claim 1 are applicable to Claims 17 and 21. Regarding Claim 21, Aloni et al further disclose a processor for executing stored program instruction; and a memory connected to processor for storing the program instructions steps (Figure 1/ 2 and 13, Processor 67. Memories for storing the program instruction steps are inherently a part of and necessarily connected to the processor.).

With regards to Claims 19 and 22, arguments analogous to those presented for Claim 9 are applicable to Claims 19 and 22. Regarding Claim 22, Aloni et al further disclose a processor for executing stored program instruction; and a memory connected to processor for storing the program instructions steps (Figure 1/ 2 and 13, Processor 67. Memories for storing the program instruction steps are inherently a part of and necessarily connected to the processor.).

7.      Claims 5 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Aloni et al (U.S. 5,619,429) further in view of Neary et al (U.S. 6,016,357) and Mansfield et al (U.S. 5,965,306).

Regarding Claim 5, neither Aloni et al nor Neary et al explicitly disclose a method according to Claim 1, further comprising a step of categorizing defects based on

simulation results produced in step (c). Mansfield et al disclose a method of determining the printability of photomasks defects comprising a step of categorizing defects based on the simulation results (Column 7, Lines 41-46; Column 9, Lines 13-21. Based on the mask critical dimension (CD) errors, the defects are categorized to verify whether it is necessary to be repaired or not. This will determine if an undesirable feature on a mask (reticle) is a critical defect or not.). It would have been obvious to a person of ordinary skill in the art at the time the invention was made to modify Aloni et al and Neary et al combination according to the teachings of Mansfield et al to categorize the defects based on simulation results produced in step (c) because it will limit the repairs of the defective reticles to those which will adversely affect the performance of the semiconductor integrated circuit.

With regards to Claim 12, arguments analogous to those presented for Claim 5 are applicable to Claim 12.

8.      Claims 18 and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Aloni et al (U.S. 5,619,429) further in view of Neary et al (U.S. 6,016,357) and Medvedeva et al (U.S. 6,171,731).

Regarding Claim 18, neither Aloni et al nor Neary et al explicitly disclose a computer readable medium according to Claim 17, comprising at least one of a magnetic diskette, magnetic tape, a CD-ROM, a random access memory chip, and a read-only computer memory chip. The indicated memories are the conventional types of memories as disclosed by Medvedeva et al. Medvedeva et al disclose an aerial image simulation system for the aerial images produced by a mask to be used in

patterning an integrated circuit chip including a computer readable medium comprising

at least one of a magnetic diskette, magnetic tape, a CD-ROM, a random access

memory chip, and a read-only computer memory chip (Figure 10; Column 19, Lines 4-

13). It would have been obvious to a person of ordinary skill in the art at the time the

invention was made to modify Aloni et al and Neary et al combination according to the

teachings of Medvedeva et al to include a computer readable medium comprising at

least one of a magnetic diskette, magnetic tape, a CD-ROM, a random access memory

chip, and a read-only computer memory chip because these are the conventional types

of memory routinely utilized in the art.

With regards to Claim 20, arguments analogous to those presented for Claim 18

are applicable to Claim 20.

### Other prior art cited

9.      The prior art made of record and not relied upon is considered pertinent to

applicant's disclosure.

Paper in IBM Journal of Research and Development to Budd et al titled

"Development and Application of a New Tool for Lithographic Mask Evaluation, the

Stepper Equivalent Aerial Image Measurement System (AIMS)".

### Contact Information

10.     Any inquiry concerning this communication or earlier communications from the

examiner should be directed to Mehrdad Dastouri whose telephone number is (703)

305-2438. The examiner can normally be reached on Monday to Friday from 8:00 a.m.

to 4:30 p.m.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's

supervisor, Amelia Au can be reached on (703) 308-6604.

The fax phone numbers for the organization where this application or proceeding

is assigned are (703) 872-9314 for regular communications and for After Final

communications.

Any inquiry of a general nature or relating to the status of this application or

proceeding should be directed to the T.C. Customer Service Office whose telephone

number is (703) 306-0377.

*Mehrdad Dastouri*

Mehrdad Dastouri
Patent Examiner
Group Art Unit 2623
December 20, 2002